i-STS

19 inch Rack mount

S T A T I C T R A N S F E R S W I T C H E S

Model i-STSBs/M – 1P2

SAMPLE ONLY

i – STS **Manufacturing** is a subsidiary of STATIC POWER PTY. LTD.
ABN 42 101 765 913

This manual refers to: Model i-STS32Bs-1P2

Electrical Specifications

Rating	32 Amperes RMS
Voltage Rating	230 V ± 20%
Frequency	50 Hz ± 10%
Permissible Voltage Distortion	10% THDV
Fault rating	2 kA, 10 msec
Protection	100 Ampere Fuses
Type	Thyristor
Manufactured	1st December 2005
Warranty	24 Months (Return Basis)
Maximum Ambient	40 °C
Dissipation	< 60 Watts @ 32 A RMS
IP Rating*	IP20
Maintenance Bypass	Integral CAM 2 Pole overlapping
Bypass Interlock	Yes – Electrical Common
Neutral Rating	32 Amperes
Fault Current Setting	5 times rated peak (pre-set)
Parallelable	No
Overload Ratings	36 Amps 60 minutes (120 %) 50 Amps for 10 seconds (150 %) 125 Amps for 1 sec
Fault Capacity	2,000 Amps (10 msec).
Synchronization Window	10 deg. (Settable 5 – 180 deg)
Break Time	< ¼ cycle
Sensing Time	< 1 msec
LAN Browser	No
Modbus TCP	No
Set-up	LCD
Remote I/o	Contacts (50 V DC, 1 Ampere n/c)
Device Ratings	120Amps,1800Volts,100,000 A^2S
dv/dt	1000 v/usec

Environmental

* Not for outdoor use.

Storage	0 – 70 °C
Operating	0 – 40 °C
Humidity	5 – 90 % non condensing
Altitude	1000 m no de-rating
Audible Noise	50 dB(A) @ 1.5 metres

SAMPLE ONLY

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SAMPLE ONLY

1. OPERATIONAL DESCRIPTION

A Static Transfer Switch, (STS) provides your critical load or single chord (single supply), technology equipment with an alternative supply source, thus increasing and improving distribution reliability and availability.

i-STSB rack mounted static transfer switches are manufactured as a two pole. Both the active conductor and the neutral are switched. Thyristors are used to undertake the switching process. These are many times faster and more rugged and reliable than their electromechanical equivalents.

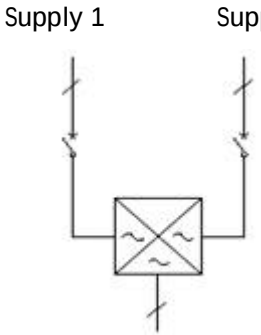


Fig. 1.

The Static Transfer Switch continuously monitors the supply sources and should the supply presently connected to the critical load fail or degenerate to not be useable by the critical load the critical load is automatically and transparently transferred to the alternate source.

This switching process is undertaken as a break before make. The break in the supply transition is so short that it is not seen to the critical load. This is preferable to a make before break (or overlapping) change-over because when the two supplies are different and connected together large and unpredictable currents would flow between the sources degenerating both supplies and therefore the supply to the critical load.
This model - i-STSB, Static Transfer Switches can not be ganged or inter connected to form a multi-pole arrangement.

SAMPLE ONLY

2. CONTROLS

Maintenance Controls

If you have an i-STSBsM model than you have a Maintenance Bypass switch located on the front panel.

This is a make-before-break transition between the STS output and either incoming supply 1 or 2 depending on the direction that you turn the switch. The user should only operate the switch to the supply that is indicated by the STS as being selected. E.g. if the STS is on supply 1 then only use the bypass switch to go to supply 1. The switch has provision for locking (using a pad-lock) into any one of the tree positions, (supply 1, normal (depicted as "N"), and supply 2).

Normally the switch is left in the "N" position.
The switch is used only for maintenance purposes when the STS is faulty and requires maintenance and the STS module needs to be removed.

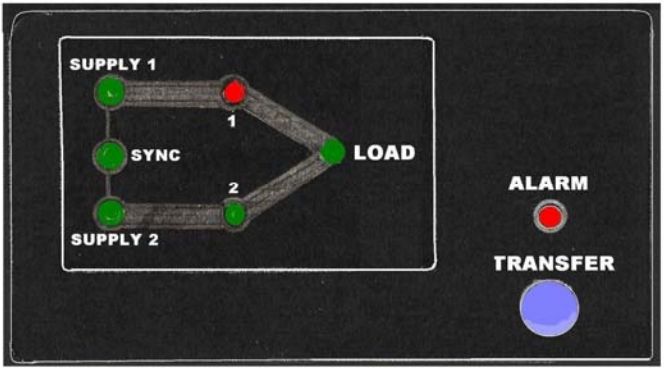
The two incoming protection isolators on the front panel adjacent to and to the right of the Maintenance bypass switch do not isolate power to the load when the maintenance Bypass Switch is in position 1 or position 2.

These isolators will remove power to the static portion of the Static Transfer Switch when in normal operation and should not be operated unless undertaking maintenance or in an emergency. With the STS removed there is a break when using the maintenance bypass switch from position 1 to 2 (or vica versa) through the "N" position.

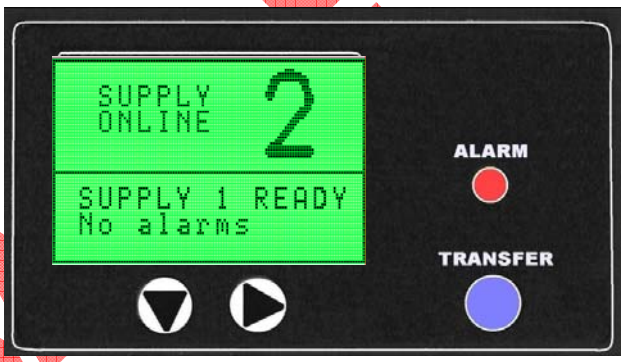
SAMPLE

Front Panel Controls

The front panel as depicted only has one control pushbutton, "**TRANSFER**". This toggles between the two supply sources. Throughout this manual they will be referred to as "Supply 1" and "Supply 2" respectively. The output for the critical load will be referred to as "Supply 3".



The LCD version of the control panel has two additional screen information selection control pushbuttons; however, these do not perform any operational function.



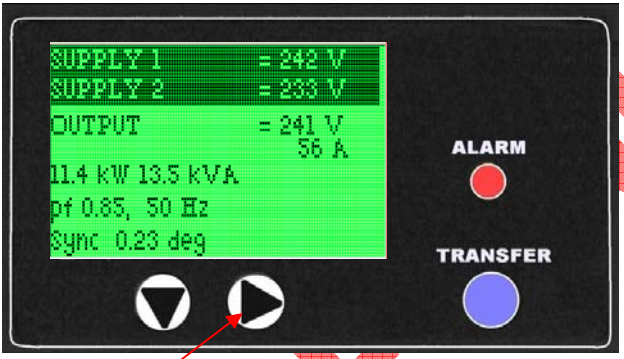
There are other user controls; however, these reside on the back panel and / or via the HLI interfaces. These additional controls are not required for normal operation.

Depiction may vary depending on model.

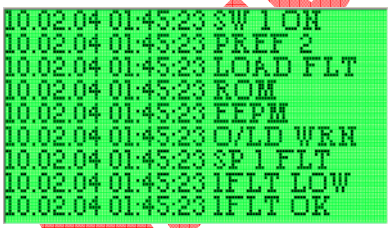
3. LCD INTERFACE

A red LED "**ALARM**" is used to indicate a non normal condition or state. The LCD will indicate the nature of the abnormality.

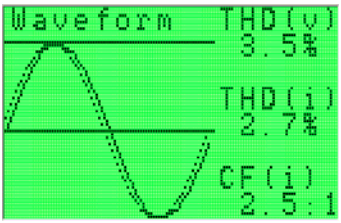
Operation through the LCD hierarchy allows screen function selection using the ▼ key. Where additional information is available on subsequent screens, such as Event History and Set-up then these are accessed using the ▶ key.



Event List (100 events)
Use ▶ to view more

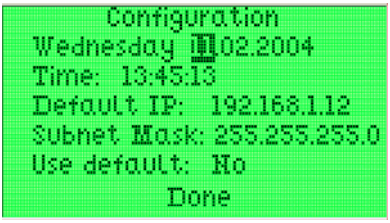


Load Power Quality Analyser
(via - password 000)



Current => ……. waveform
Voltage => _____ waveform

SAMPLE ONLY



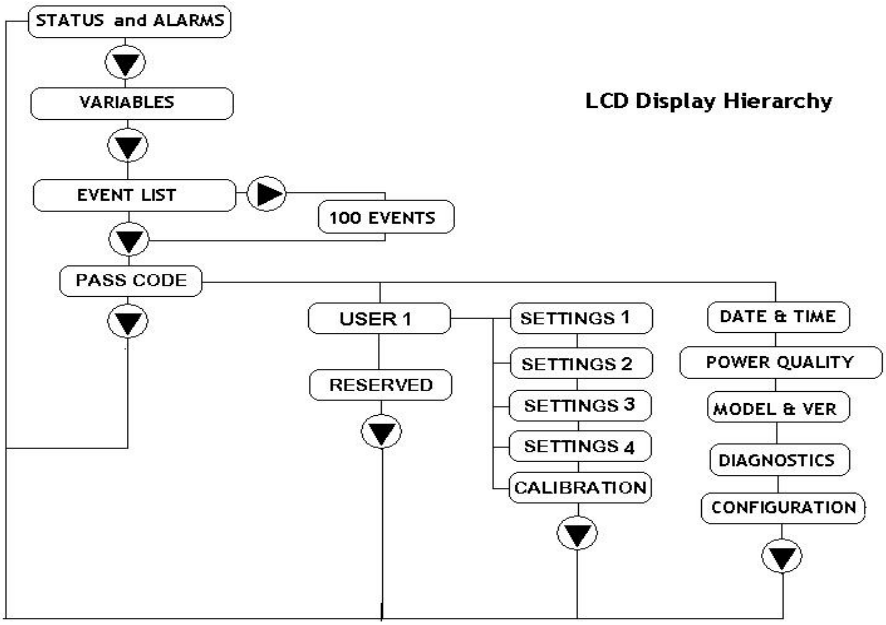
For example to set the time from the Configuration screen press the ▶ key. A cursor will then highlight the variable field. Press the ▼ key to vary the field.

Holding the key for more than 2 seconds will allow a fast scroll. When set to the desired value use the ▶ key to move to the next field and repeat the process.

To affect a transfer to the alternative supply manually the user must press and hold the TRANSFER pushbutton for at least 2 seconds.

SAMPLE ONLY

This diagram shows the available options and how to navigate them:



STATUS shows which supply (1 or 2) is connected the critical load.
This supply also indicates any pending alarm condition.

VARIABLES indicates the input and output electrical parameters.

POWER QUALITY assessment is made by visually showing a snap shot of the voltage and current waveforms. Crest factor and a harmonic analysis of the waveforms provide a power quality estimate for the load.

EVENT LIST Any changes of state and or alarms generated are recorded in real time in a circular 100 event buffer.

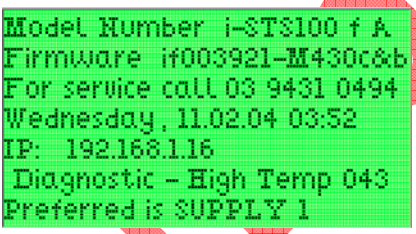
A **PASS CODE** is required to gain entry to the SETTINGS, DIAGNOSTICS, CONFIGURATION and CALIBRATION screens. (3 levels of access allow changing of values within recommended limits, a second level allows setting without limits and a third level allows access to other not normally used access points / values).

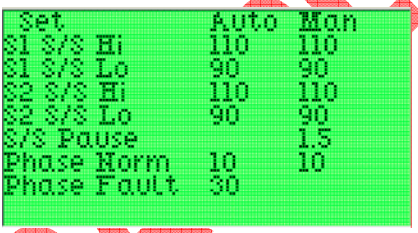
RESERVED may contain specific options and configurations applicable only to your units.

Additional set-up / configuration and calibration screens are accessible only by entering the correct passcode.

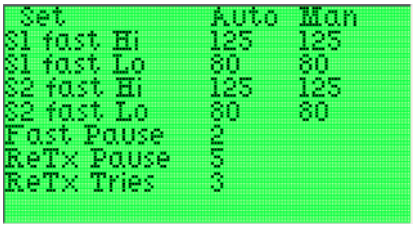
It is important that the user understands the consequences of the changes made within these menus as unpredictable and incorrect operation may result if settings are incorrectly set.

Incorrect setting is not covered by the warranty. Refer to Section 7.

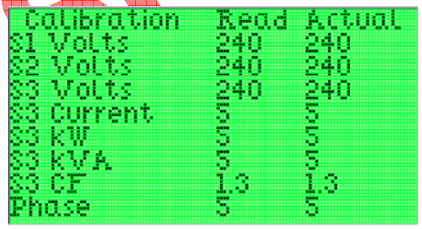




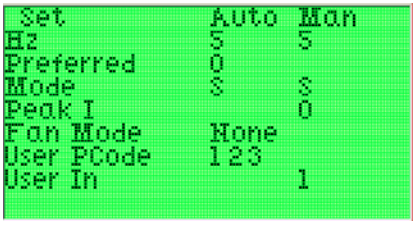
Set	Auto	Man
S1 S/S Hi	110	110
S1 S/S Lo	90	90
S2 S/S Hi	110	110
S2 S/S Lo	90	90
S/S Pause		1.5
Phase Norm	10	10
Phase Fault	30	



Set	Auto	Man
S1 fast Hi	125	125
S1 fast Lo	80	80
S2 fast Hi	125	125
S2 fast Lo	80	80
Fast Pause	2	
ReTx Pause	5	
ReTx Tries	3	



Calibration	Read	Actual
S1 Volts	240	240
S2 Volts	240	240
S3 Volts	240	240
S3 Current	5	5
S3 kW	5	5
S3 kVA	5	5
S3 CF	1.3	1.3
Phase	S	S



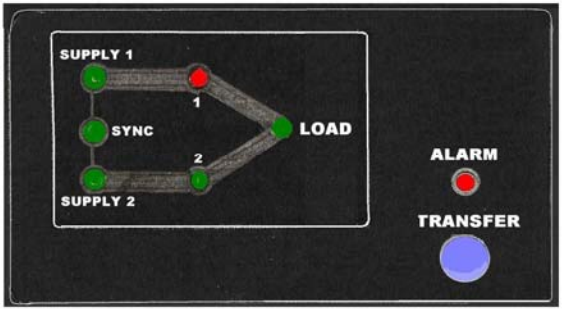
Set	Auto	Man
Hz	S	S
Preferred	0	
Mode	S	S
Peak I		0
Fan Mode	None	
User PCode	123	
User In		1

SAMPLE ONLY

4. LED INTERFACE

LED front panel controls consists of only one manually operated transfer switch pushbutton. The user must press and hold for At least 2 seconds to affect a manual transfer to the alternate supply. Note that manually transferring overrides the preferred source selection at the rear of the unit.

The LED mimic shows a limited number of operational states. These are as outlined below. If the Alarm LED is "ON" and the STS condition is not immediately able to be determined from the LED indicators then the user may use the HLI port or voltage free contact status at the rear of the STS to further interrogate the unit.



SUPPLY 1	Green -> Available Green Flashing -> Not within Specification Red -> Failed
SUPPLY 2	Green -> Available Green Flashing -> Not within Specification Red -> Failed
1	Green -> On Line (connected to critical load) Red -> Not on (NOT connected to critical load)
2	Green -> On Line (connected to critical load) Red -> Not on (NOT connected to critical load)
SYNC	Green -> In synchronism Green Flashing -> Occasionally in Synchronism Red -> Not in synchronism
LOAD	Green -> Normal Red -> Alarm (flashing) -> Overloaded

5. REAR PANEL CONTROLS

SAMPLE

com c b a G F E D C B A
LAN
1 0 2
PREFERRED
1 0 2
OVERRIDE
i - STS Manufacturing +6 13 9431 0494
Static Transfer Switch Type S 240 Volts, 50 Hz
DANGER This equipment has 2 AC Supplies
3-Phase Bus
Parallel Bus
PC SETUP - RS232

The main power flows through the power plugs on the left side of the removable RHS module of the static transfer switch, (Note that terminal arrangements may differ for the model supplied. Please refer to the schematic details at the rear of this manual for specific connection information).

Some models have an Electrical Interlock connection between the Maintenance Bypass and the STYS. This is located in the vicinity of the LAN connection. Ensure that the Maintenance Bypass electrical interlock plug is inserted and pushed fully home.

3-Phase and Parallel Bus connection points omitted on single phase only units.

SAMPLE ONLY

PREFERRED SOURCE SELECTION (pre-set)

0	No preferred source
1	Supply 1 is the preferred source. If STS is forced to automatically transfer the critical load to the alternate (Supply 2) source the STS will automatically transfer back to Supply 1 when again within tolerance and a pre-set settling delay.
2	Supply 2 is the preferred source. If STS is forced to automatically transfer the critical load to the alternate (Supply 1) source the STS will automatically transfer back to Supply 2 when again within tolerance and pre-set settling delay.

CONTROL OVERRIDE (CAUTION for Maintenance ONLY)

0	Normal – Automatic
1	Control Override -> Supply 1 is forced to supply the critical load directly overriding any internal control logic.
2	Control Override -> Supply 2 is forced to supply the critical load directly overriding any internal control logic.

SAMPLE ONLY

3-PHASE BUS Not Available in this model

Parallel Bus Not Available in this model

6. REAR PANEL USER ACCESS

CAUTION

The power cabling should not be run adjacent to user controls. Separate these control cables from power circuits by at least 300 mm. The control signals are distance limited to 30 metres.

All output relays contacts are rated for 50 V DC 1 Ampere (Not 230 V AC rated)

User Remote Inputs (Voltage free contact closure controllers only)

COMM -> Common return

- **a ->** Transfer to Supply 1
- **b ->** Transfer to Supply 2
- **c ->** Fire Stop (Causes both Switches to go off – loss of output)

User Relay Outputs

Relays are normally closed and held open in OK state (closed contact represents the alarm state).

- **A ->** General Alarm
- **B ->** Not in Synchronism
- **C ->** Supply 1 OK
- **D ->** Supply 2 OK
- **E ->** ON Supply 1
- **F ->** On Supply 2
- **G ->** Overloaded

RS232 PORT

All settings and calibrations can be performed through the front panel.

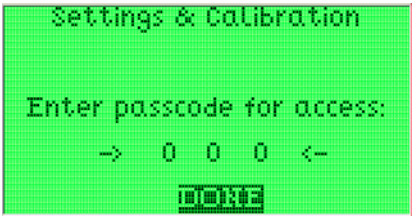
LAN

See LAN Supplement Manual

SAMPLE ONLY

7. SETTINGS AND ADJUSTMENTS

Screen 1



Basic password "000"
Settings Password 123 for access level that allows adjustment between the parameters shown only.

Within the Settings menu's there are two setting ranges
One for user manually initiated transfers using the front panel push button "Man"
And
Settings that are used under fault detected conditions, "Auto"

It is important that the Auto Settings be set wider than the normal operating source limits, (e.g. wider than the UPS capability). Otherwise you may experience unstable operation of the STS responding to conditions that are normal for the supply.

In general the STSs function is to transfer to the alternate source when the online source becomes unavailable. The STS should not be considered as protection against power quality from the source.

There are 5 screens of settings and calibration.

- **Screen 1**

Set	Auto	Man	Comment
S1 S/S Hi	110	110	% from nom 105 – 125 % (120 %)
S1 S/S Lo	90	90	% from nom 0 – 95 % (70 %)
S2 S/S Hi	110	110	% from nom 105- 120% (110 %)
S2 S/S Lo	90	90	% from nom 0 – 95% (90 %)
S/S Pause		1.5	1 – 3 sec (1.5 sec)
Phase Norm	10	10	1 – 180 deg (10 deg)
Phase Fault	30		1 -1 80 deg (30 deg)

SAMPLE ONLY

The column to the right shows the variation setting limits for each parameter.
Set describes the parameter for adjustment:

S1 S/S Hi (Supply 1 Steady State High)
Averaging time constant for this parameter is defined by "S/S Pause" typically 1.5 seconds.
Set as a percentage from nominal – Default setting 120%

S1 S/S Lo (Supply 1 Steady State Low)
Averaging time constant for this parameter is defined by "S/S Pause" typically 1.5 seconds.
Set as a percentage from nominal – Default setting 70%

S2 S/S Hi (Supply 2 Steady State High)
Averaging time constant for this parameter is defined by "S/S Pause" typically 1.5 seconds.
Set as a percentage from nominal – Default setting 120%

S2 S/S Lo (Supply 2 Steady State Low)
Averaging time constant for this parameter is defined by "S/S Pause" typically 1.5 seconds.
Set as a percentage from nominal – Default setting 70%

S/S Pause (steady State Averaging time constant)
This is the time that the steady state values need to be outside the limit values before a fault condition is determined to be true.

NOTE adjustment may be required to the steady state values if the source supply voltages are above or below nominal, generally the setting should be set to 120% of the value of the supply source, in the range of 105-125% setting too close a limit to the actual operating Steady State voltage may cause erratic Static Transfer Switch operation.

Also setting the averaging time to too small a value (< 1 sec) may cause erratic operation.

SAMPLE ONLY

Phase Norm setting limits 0 – 180 degrees default 10 degrees
Phase margin in electrical degrees for which a normal user initiated no-break manual transfer can be achieved. Pushbutton requests when the angle is greater than that shown will be ignored. If however, the supplies are continually varying because the sources are operating at different frequencies and as long as the difference frequency is within 5% (2.5Hz) pressing and holding the pushbutton for 10 seconds will latch the request which will be processed when the two supplies come within the setting limit where the transfer request will then be activated. If however, the supplies do not come back into synchronism within 60 seconds the user latching request will be cancelled. Although the setting limit can be set from 0 to 180 degrees the consequence of transfers when not in synchronism may result in a non seamless transfer for the critical load. Ferromagnetic devices such as transformers will saturate and draw large current when out of synchronism transfers are undertaken. The effect on some switchmode power supplies is also unknown. The user should consult with the equipment manufacturer to ensure that damage does not result from out of synchronisation transfers and what their recommended synchronization limits are.

When set to "0" disables the transfer pushbutton operation.

If the programmed value in the "Auto" column is exceeded no action takes place. Refer to "Phase Fault"

Phase Fault (setting limits from 0 to 180 degrees electrical). Automatically initiated transfers due to supply source / output supply faults when a transfer to the alternate source is necessitated. The recommended default of 30 degrees. Up until this value transfers that are initiated from the system (except manually) will occur without a break. Once the displacement between the two phases is more than this value (30 degrees) a break as defined by "Phase Break" is inserted. Settings to 180 degrees are possible.

The application of inserting a break when the two supplies are significantly out of synchronism has been established to prevent the inadvertent damage to equipment, tripping of protection devices or

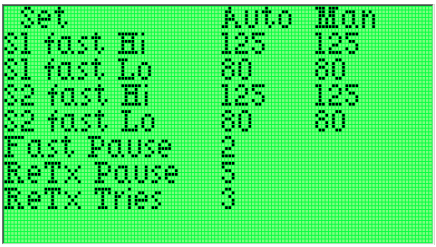
SAMPLE ONLY

opening of fuses that could result from overfluxing of transformers, misfiring of switch mode power supplies. The philosophy is that it is better to allow the equipment to shutdown orderly and re-power up normally rather than under fault conditions. The minimal value would be considered at 50 msec.

Phase Break Setting of "0" insert no-break 10 – 150 msec with resolution of 10 msec. These are typical break insertion times, additional time would be added as a result of thyristor turn-off delays.

SAMPLE ONLY

Screen 2



% from nom 108– 135% (130 %)
% from nom 92 – 0 % (65%)
% from nom 108– 135% (135 %)
% from nom 92 – 135% (65 %)
1 – 100 msec (1 = 330 usec)
0 – 300 sec (5 sec)
0 – 5 (0 inhibits), (3)

S1 fast Hi (Supply 1 Transient High)
Transient time constant for this parameter is defined by "Transient over-sampling time constant 2 x 330 Micro Sec"
Set as a percentage from nominal – Default setting 130%

S1 fast Lo (Supply 1 Transient Low)
Transient time constant for this parameter is defined by "Transient over-sampling time constant 2 x 330 Micro Sec"
Set as a percentage from nominal – Default setting 65%

S2 fast Hi (Supply 2 Transient High)
Transient time constant for this parameter is defined by "Transient over-sampling time constant 2 x 330 Micro Sec"
Set as a percentage from nominal – Default setting 130%

S2 fast Lo (Supply 2 Transient Low)
Transient time constant for this parameter is defined by "Transient over-sampling time constant 2 x 330 Micro Sec"
Set as a percentage from nominal – Default setting 65%

Fast Pause (Transient over-sampling time constant)
This is the transient over-sampling quantity / times that the values need to be outside the limit values before a fault condition is determined to be true.

ReTx Pause
Operates only when originally on preferred source and when preferred source has been set and an automatically initiated

SAMPLE ONLY

transfer to the stand-by alternate supply as a result of a source fault occurs. This parameter defines the delay before a re-transfer back to the original preferred source occurs after the fault has been cleared and the source has returned to normal steady state conditions.

This parameter is usually set to 5 seconds. If set to too small a value an unstable condition could result because the source response time is similar to the re-transfer time and the source has not been given enough time to recover.

Preferred source is set to either Supply 1 preferred or supply 2 preferred or no preferred source using the slide switch on the user controls mounted at the rear of the STS. Also see preferred software setting to follow.

ReTx Tries

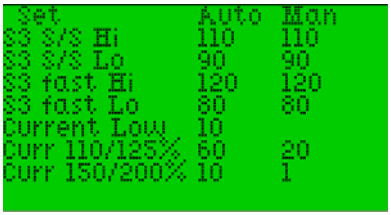
This setting refers to the number of times that an transfer back to the preferred source will be attempted. A lock out results after this but is re-set on new fault alarm condition.
A setting of "0" inhibits re-tries even when preferred source is set a transfer when initiated will not result in a transfer back to the preferred.

NOTE adjustment may be required to the Transient values if the source supply voltages are distorted or above or below nominal. Setting too close a limit to the actual operating Steady State voltage may cause erratic Static Transfer Switch operation.

Also setting the over sampling time to too small a value (1) may cause erratic operation.

SAMPLE ONLY

- Screen 3



% from nom 108-135%(125%)
% from nom 80-95%(65%)
% from nom 108-135%(120%)
% from nom 80-95% (80%)
Low current threshold (10%)
Overload time (min) @ 110 &125 % Overload
Overload time (min) @ 150 & 200 % Overload

S3 /Output Steady State High % from nom 108-135%(125%)
Averaging time constant for this parameter is defined by "S/S Pause" typically 1.5 seconds.
Set as a percentage from nominal – Default setting 125%
Should always set this parameter wider than the S1 & S2 steady stat high threshold. This will ensure that when there is a problem with S1/S2 event list will report correctly. S3 sensing is provided as redundant sensing for on line source S1 or S2 and in case of internal thyristor triggering fault. Operation is to transfer to the alternative source.

Output Steady State Low % from nom 0-95%(65%)
Averaging time constant for this parameter is defined by "S/S Pause" typically 1.5 seconds.
Set as a percentage from nominal – Default setting 65%
Should always set this parameter wider than the S1 & S2 steady stat low threshold. This will ensure that when there is a problem with S1/S2 event list will report correctly. S3 sensing is provided as redundant sensing for on line source S1 or S2 and in case of internal thyristor triggering fault. Operation is to transfer to the alternative source.

Output transient High % from nom 108-135%(120%)
Transient time constant for this parameter is defined by "Transient over-sampling time constant 2 x 330 Micro Sec"
Set as a percentage from nominal – Default setting 133%

SAMPLE ONLY

Should always set this parameter wider than the S1 & S2 transient high threshold. This will ensure that when there is a problem with S1/S2 event list will report correctly. S3 sensing is provided as redundant sensing for on line source S1 or S2 and in case of internal thyristor triggering fault. Operation is to transfer to the alternative source.

Also transient limits should be set outside steady state limits.

Output transient Low % from nom 80-95% (80%)
Transient time constant for this parameter is defined by "Transient over-sampling time constant 2 x 330 Micro Sec"
Set as a percentage from nominal – Default setting 60%

Should always set this parameter wider than the S1 & S2 transient high threshold. This will ensure that when there is a problem with S1/S2 event list will report correctly. S3 sensing is provided as redundant sensing for on line source S1 or S2 and in case of internal thyristor triggering fault. Operation is to transfer to the alternative source.

Also transient limits should be set outside steady state limits.

Low current threshold (0%)
Normally set to "0", defines the minimum vale for units load. The units supplied have an output load resistor located in the maintenance bypass enclosure. Otherwise set to 2% if testing unit without being plugged into maintenance bypass (e.g. for testing). Setting to non zero value ill disable thyristor open circuit and short circuit detection until after the threshold has been reached.

Overload time (min) @ 110 &125 % Overload
Exceeding the overload limits of 110 % for greater than 60 minutes OR 125 % for 20 Minutes will not affect the critical load and no switching occurs. It is intended as a warning that the STS is overloaded. Failure to reduce the load will cause semiconductor failures.

SAMPLE ONLY

Consult manufacturer before setting to higher values to ensure that the unit will operate safely without failure or overheating.

Overload time (min) @ 150 & 200 % Overload

Exceeding the overload limits of OR 150% for 10 Minures OR 200% for 1 Minute will not affect the critical load and no switching occurs. It is intended as a warning that the STS is overloaded. Failure to reduce the load will cause semiconductor failures.

Consult manufacturer before setting to higher values to ensure that the unit will operate safely without failure or overheating.

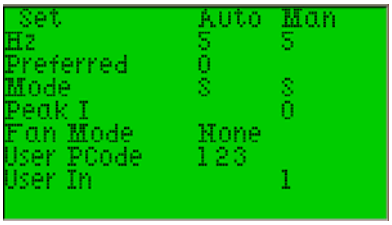
Xfer Timer Usually left at "0" settable 0 to 1275 (increments of 15 minutes per increment.

Setting of "0" disables function

After the set period the STS will undertake a test transfer to the alternate source. After a delay the load will be returned to the original source. This function is used to test functionality and protections within the STS.

SAMPLE ONLY

Screen 4



Deg from 50Hz +/- 9Hz (5Hz)
1 or 2 or 0 (none) – (0)
S, F or B (S)
150 – 1500 % (800 %)
0 None, 1Current, 2Temp(0)
123
1 toggle,2 1&2,3 no STOP (2)

Hz

Allowable frequency tolerance for Supply 1 and Supply 2. Exceeding these limits will cause a transfer to the alternate source. E.g. a setting of 5Hz is the default. Settings of greater than 5 Hz are not recommended.

Settings for Man will inhibit user manual transfers when greater than the setting.

Preferred (0)

Similar to the rear panel section of preferred source. This is useful if access to the rear panel preferred source selection is impaired. The rear panel slide switch overrides any settings on this screen. To ensure operation the rear panel slide switch needs to be in the "0" centre position. In all other respects the control operates as per the rear panel slide switch.

Mode (s)

's' refers to standard mode. All STSs supplied "B type" are standard thyristor STSs. The selections B and F refer to interrupting capability of some models. In this case the switch can be configured to operate in the standard thyristor mode (current zero turn-off) when manually transferred by the user from the front panel to either current blocking or fast interrupt & transfer.

Peak I (Unable to set through user interface)

This is the value of peak load current that is used to inhibit a transfer to the alternate source even if the voltage is adversely affected. This setting is used to prevent the transfer of a load fault

SAMPLE ONLY

to the alternate source. This is necessary when supplied from two UPSs so that the both UPSs are not affected by the load fault. The STS remains on the original source even if this causes loss of supply to the source. The system will automatically reset to normal mode a few seconds after the return of a good voltage on the source and the current falling below the threshold (e.g. the fault ahs been cleared).

On the equipments supplied this has been pre-set in hardware to 200 – 250 Amperes peak and cannot be changed by the user through this menu option.

Fan Mode (None)

Model B units less than 40 Amperes do not have fans. 50 and 63 Ampere units have fans that are continuously operated fixed by hardware. Some models have controls that would be settable through this interface to allow either:
Fan to be stopped / started by current threshold level
OR
Temperature sensor on heatsink detects that it necessary to operate the fan.

User PCode (123)

Settable by user. If forgotten it is possible to re-load the defaults by gaining access to the outer 2 dip switches (ON) of the 4 wsay dip switch on the LCD controller board.

User In (pre-set to mode 1)

Refers to the operation of the User Inputs (a,b,c) on the rear panel of the STS as:
Standard Mode (1) as:
Emergency Power OFF (loss of output whilst held closed)
Transfer to Supply 1
Transfer to supply 2
OR (2)
Emergency Power OFF (loss of output whilst held closed)
Toggle transfer, (similar to front panel pushbutton)
Inhibit transfer - ignore toggle
OR 13 / 23
Disable Remote Power off

SAMPLE ONLY

FAULT DIAGNOSIS & MAINTENANCE

The STS s has been manufactured to provide a long, reliable and useful life. However, all equipment needs some maintenance.

If the screen does not come up with the normal WELCOME page then it may be necessary to RESET the control panel. This is accomplished by pressing and holding all of the front panel pushbuttons simultaneously for more than 3 seconds.

Operate only if control is lost or the display is corrupt and normal display selection pushbuttons do not fix the problem. Report such occurrences.

After the welcome sign you may be prompted to enter the date and time. This will be required the first time only. We strongly encourage the setting of the date and time so that real time event correlation can be undertaken. The Real Time Clock is thereafter battery backed up.

If DIP switch 1 & 4 on LCD control board are set to on the default settings are re-programmed .

SAMPLE ONLY

SET-UP / CALIBRATION & ADJUSTMENT

After entering the correct password access to the following adjustment screens is available.

The user should use caution in adjusting any of the operational variables as incorrect setting may cause incorrect operation and or loss of the critical load.

The following screens indicate the contents and functionality.

- Screen 5

Calibration	Read	Actual
S1 Volts	240	240
S2 Volts	240	240
S3 Volts	240	240
S3 Current	5	5
S3 kW	5	5
S3 kVA	5	5
S3 CF	1.3	1.3
Phase	5	5

240 Volts RMS
240 Volts RMS
240 Volts RMS
100 % RMS
*Calculated V *A as % of Rated*
Calculated kW as % of Rated
1.4 or peak : RMS calculated
in degrees supply1 to supply2

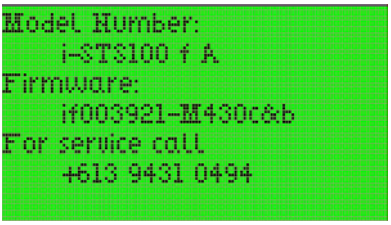
User measures Actual using a reference meter and types in the value under the column Actual.
Read is the present value as indicated on the variables page.

If using the LCD then use the ▶ key to move to the correct field and then the ▼ key to scroll to the correct value.

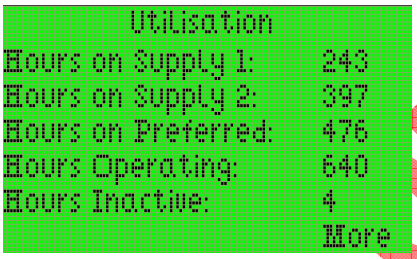
Once completed an exit is affected by ▶ key through the selection list past the last calibration option.

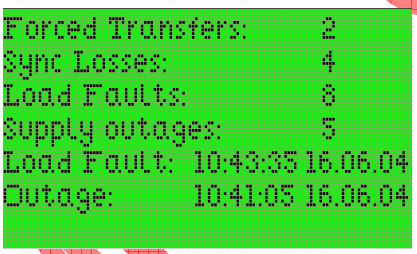
SAMPLE ONLY

Accessed by entering PCODE “000” (Version control)



STS Utilisation Screens

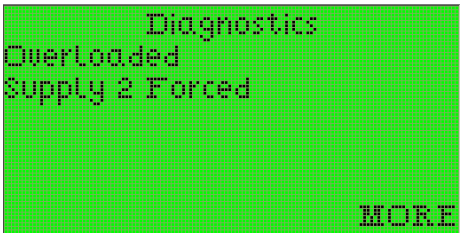




Diagnostics Screens (see also Section 14)

The diagnostics screens show the present state or alarm condition or fault.

SAMPLE ONLY



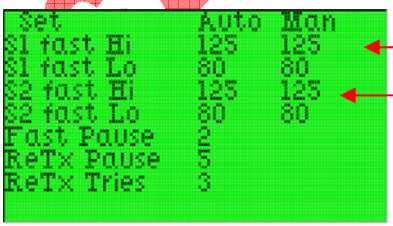
The diagnostics screen provides information in respect to the present condition or status of the STS. As many items will be indicated as necessary to describe any abnormal condition.

Compensating for non nominal sources

By selecting ▶ (More) hardware diagnostics determine the deviation of the normalized incoming voltages with the activation levels. If an error of greater than 3% exists it may be prudent to adjust the steady state and /or transient levels in the "Settings Menus"

On Supply: 1
S1 Nom Offset Peak: 10
S1 Nom Offset S/S: 15
S2 Nom Offset Peak: -15
S2 Nom Offset S/S: -20
S3 Nom Offset Peak: 8
S3 Nom Offset S/S: 10

e.g.
To compensate for other than nominal input voltage (say S1) adjust the High and Low parameters for S1 transient high (fast) values Hi & Lo up by 10% to compensate for the larger than anticipated incoming voltage.



Adjust these to 135% and 90 %
Similarly for S2 to 110% and 65%

Repeat process for steady state (S/S) values and S3 supply

SAMPLE ONLY

8. INSTALLATION

i-STS B comes already partially assembled ready to install. You may wish to disassemble to install within your 19 inch rack enclosure.

The most crucial aspects of the install are:

- Safety:
- Damaged to Goods
- Electrical Connectivity
- Mechanical integrity.
- Cooling

Safety is by far the most important aspect.
Signage… This equipment is powered from two separate sources. It is important that you install correct signage and procedures within the enclosure and it's immediate vicinity to warn personnel of this aspect and what isolation, checking and precautionary processes and procedures need to be adopted to make the STS and equipment connected to the STS safe to work on.

CAUTION

THIS EQUIPMENT RECEIVES POWER FROM MORE THAN ONE SOURCE. DISCONNECT OUTPUT AND ALL INPUT SOURCES OF POWER FROM THIS EQUIPMENT BEFORE SERVICING.

SAMPLE ONLY

Do not proceed with the installation or operation of the STS if it has been damaged. Carefully inspect the STS for any damage that may have occurred during shipping, unpacking or during and after any installation process.

The STS assembly is heavy and has sharp corners so if dropped you will not only damage the unit but it is likely that you could injure yourself also. Take care when handling the items and ensure that it is physically supported during the installation process. At the end of the installation process the STS should be firmly and securely bolted within the enclosure.

WARNING

HIGH LEAKAGE CURRENTS ON ISOLATED INCOMING AND OUTGOING CIRCUITS EARTH CONNECTION IS ESSENTIAL BEFORE WORKING ON CIRCUITS OR CONNECTING / DISCONNECTING SUPPLIES.

SEE INSTALLATION INSTRUCTIONS BEFORE CONNECTING / DISCONNECTING INPUT SUPPLIES.

SAMPLE ONLY

Make sure that you employ a licensed electrical contractor to install the STS. Check that the enclosure and the STS are correctly Earthed. Ensure also that all of the cables are securely connected and supported and that all safety covers are installed. There should be NO live exposed or accessible contacts that would / could cause electrical shock if contact is able to be made.

When removing the module using the handles, pull symmetrically from the frame once the facia plate screws have been removed. Always use both handles. You will notice that the Maintenance Bypass / Terminal enclosure remains in position. For safety reasons it may be prudent to install a dummy 3U front facia cover over the front of the unit is a spare is not immediately available for safety reasons and to ensure that contact is not able to be made with the power sockets. **NOTE** These may have dangerous voltages even when the module is removed.

Ancillary controls connections are as described in Section 6 of this manual. It is prudent to provide physical separation between control circuits and power circuits. This avoids confusion, reduces interference and increases the reliability of your installation. Again make sure that all control wiring is protected and securely supported so that it is not inadvertently unplugged or removed whilst other equipment is being installed or removed within the enclosure.

CAUTION

HOT

REMOVAL OF THIS PANEL EXPOSES DANGEROUS VOLTAGES

ACCESS RESTRICTED TO QUALIFIED PERSONNEL ONLY

Each STS dissipates a small amount of heat (see specifications for exact heat dissipation). It is prudent to install the STS where natural air flow through the STS can aid in its operation. This increases reliability. This may mean that cool air is allowed to enter at the bottom of an enclosure and allowed to be expelled at the top of the enclosure. It also means that you should avoid blocking the top and the bottom of the STS with other equipment. It would be prudent to leave 1 1U (44mm) separation between the STSs and adjacent equipments.

Provided these precautionary aspects are headed the STS will provide you with a reliable back-up supply capability.

Before installing the power module into the space provided ensures that the supply isolators 1 & 2 are off (down). Carefully insert the module aligning the power plugs with the sockets and push firmly home.

If the unit has been installed and is ready to turn on, before doing so. check and ensure that the side mounted power plugs are plugged in correctly and firmly home and that the facia plate is screwed home into position.

Before powering the STS up ensure that the load side is safe and any equipment or cabling connected is ready to be safely powered up.

Do not open the STS. If it is faulty it should be removed from service and returned to i-STS manufacturing for analysis and repair.

To power up operate the isolators to the on position (up). The LCD should illuminate and after a few seconds of diagnostics should switch the output

SAMPLE ONLY

to the preferred source, or that which has been selected on the maintenance bypass switch if not in the normal "N" position.

After the welcome sign you may be prompted to enter the date and time. This will be required the first time only. We strongly encourage the setting of the date and time so that real time event correlation can be undertaken. The Real Time Clock is thereafter battery backed up.

SAMPLE ONLY

9. SET-UP AND COMMISSIONING

Read this whole document thoroughly. Understand every aspect before proceeding. Request further assistance if you do not understand any aspect of the operation of the STS. Support and contact numbers are at the rear of the manual.

WARNING

HIGH LEAKAGE CURRENTS ON ISOLATED INCOMING AND OUTGOING CIRCUITS EARTH CONNECTION IS ESSENTIAL BEFORE WORKING ON CIRCUITS OR CONNECTING / DISCONNECTING SUPPLIES.

SEE INSTALLATION INSTRUCTIONS BEFORE CONNECTING / DISCONNECTING INPUT SUPPLIES.

SAMPLE ONLY

Consider electrical distribution discrimination carefully. The STS has Fuses installed which should discriminate with down stream protective devices so that other items connected to the STS are not powered off by the tripping of a circuit breaker / protective device upstream due to a down stream fault condition. The STS should trip only if the down stream device protection is unable to trip or there is a fault within the STS. The STS Fuses should discriminate with any upstream circuit breaker / protection device.

In case of down stream fault the STS will not transfer the fault to the alternate supply even if the voltage is adversely affected. Once the fault current has cleared the STS will resume normal operation protecting the critical loads from voltage disturbances, (10 second settling time).

After following all of the considerations and precautionary processes in the last section and been successful and understanding, then no further special set-up is necessary. Each unit has been fully certified and heat soaked prior to shipment.

CAUTION

THIS EQUIPMENT RECEIVES POWER FROM MORE THAN ONE SOURCE. DISCONNECT OUTPUT AND ALL INPUT SOURCES OF POWER FROM THIS EQUIPMENT BEFORE SERVICING.

SAMPLE ONLY

The red LED ALARM should not be on.
If it is check the following states.

- ON Supply 1 when priority is Supply 2
- On Supply 2 when priority is Supply 1
- Supply 1 or Supply2 are not in spec.
- Override Switch is in position 1 or 2
- Supply 1 & 2 are not in synchronism
- The unit is too hot (thermal bi-metal switch on H.S. activated)
- There is / was an overcurrent / overload / load fault condition

Ensure from the supply that you are connected too on the STS is also the supply selected by the Maintenance Bypass Switch supply. Rotate the Maintenance Bypass Switch to the central "N", normal position. If you have a remote maintenance bypass then it too should be in the normal position, prior to this step.

Try using the TRANSFER push button to transfer to the alternate supply. To affect a transfer you need to push and hold the transfer pushbutton for at least 2 seconds. The LCD should show that it is now powering the load from the other supply, (non preferred).

If the unit does not transfer check that the two supplies are available and in synchronism, (use variables display page).

Check that the rear control OVERRIDE switch at the rear of the STS is in the centre "O" position for normal operation.

Check that you have installed any maintenance bypass interlocking wiring correctly, perhaps temporarily remove the cabling and try again.

If the a load item circuit breaker trips at turn-on it is probably due to it's equipment internal inrush current, not the STS.

If a circuit breaker upstream of the STS trips there is probably a discrimination error in the protection aspects of the electrical distribution or there is a major fault within the STS.

The RED ALARM Led should be off.

SAMPLE ONLY

10. MAINTENANCE & BYPASS OPERATION

The integral maintenance bypass switch is fitted with early make auxiliary contacts to initiate the transfer to the correct supply; however, this is only possible if the STS is operating correctly. If it is not a transfer can only be undertaken when the user is sure that the supplies are both available of the same magnitude and phase.

In the case of a control failure the STS internal control logic can be overridden and the output can be forced to the correct state using the OVERRIDE switch to position 1 or 2 as appropriate. Remember that the switch needs to be in the centre "O" position for normal operation.

The override provides control logic bypass only' it does not provide an alternative path for the load power.

NEVER attempt to operate the bypass switch if the supplies are not in synchronism. There is no mechanical interlock to prevent the switch from being operated when the supplies are not available or not in synchronism

Where the STS B has been purchased without an integral Maintenance Bypass Supply Switch a separate maintenance bypass should be installed.

Where an integral Maintenance Bypass Switch is installed the following descriptions do not apply.

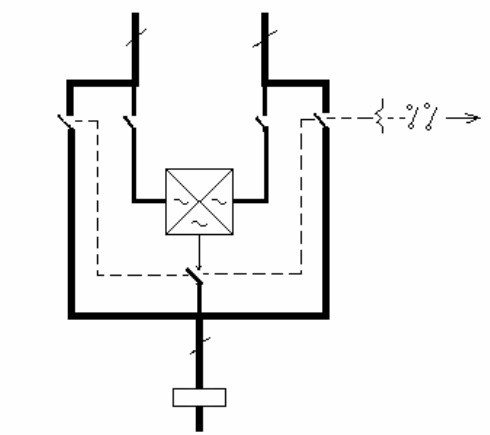
Use the contact at the rear of the unit to aid with the control cabling of the maintenance bypass switching arrangement as shown.

- We recommend an appropriately rated 2 or 3-position (multi-pole) CAM operated switch with overlapping contacts incorporating early make auxiliaries and solenoid interlock.

- The auxiliaries will ensure that the STS is in the correct state before the STS is made. These interface to the transfer controls, (e.g. uses Transfer to supply 1 and transfer to supply 2 user inputs on the back panel of the STS).

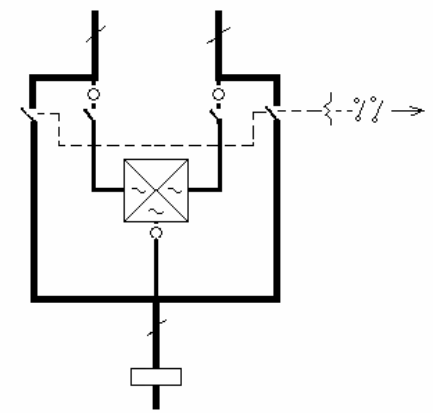
- Similarly the solenoid interlock is supplied from the output to prevent operation when the supplies are not in synchronism or when the STS is in the incorrect state.

SAMPLE ONLY



This is the conventional method for a bypass arrangement with a 3 position switch. Bypass to 1 and isolate STS, Normal and Bypass to 2 and isolate STS.

Alternatively:



Once bypassed this 2 pole switch arrangement allows removal of the i-STS because of its hot socket capability.

See Section 6 Rear Panel Access. You will need to configure the Screen 4 "User In" inputs to "2" to change the inputs from toggle mode to "a" => "Transfer to Supply 1" and "b"=> "Transfer to Supply 2"

SAMPLE ONLY

Always CHECK and ensure that the STS is in the correct state (on supply 1 or 2) equivalent to the Supply that you want to transfer to.

Use the "B" output and inhibit operation of the maintenance bypass switch until the supplies are in synchronism.

These inputs and outputs can then not be used for remote signalling also. See HLI interface.

CABLING

i-STS plug receptacle consists of a Spring Cage Terminal Blocks.

The connectors can accommodate up to a single 16mm^2 cable on 20/ 32 & 50 Ampere models and a 25 mm ^{2} cable on the 63 Ampere rated unit.

Each of the three supplies (supply 1, supply 2 and supply 3 (output supply)), has facilities for an active and a neutral conductor. The neutrals are bonded internally.

The cable clamp bar should be to support the cables and relieve any strain on the terminal blocks.

SAMPLE ONLY

11. INTERPRETATION OF LCD EVENT LIST

The explanatory text on the LCD screen has intentionally been abbreviated.

INIT		RAM CHKsum failed – Cold Start (RAM Corrupt)	Alarm Notify for Service
BOOT		Warm Start, re-initialize all but RAM	Event - No action
WDOG		Signals software / hardware problems	Alarm Notify for Service
STAC	FLT	Stack or Heap has overflowed	Alarm Notify for Service
EEPM	FLT	EEPROM Checksum error – cal may be damaged	Alarm Notify for Service
ROM	FLT	ROM has been corrupted	Alarm Notify for Service
BATT	LOW	Battery has low power (needs replacing)	Alarm Notify for Service
COMS	1/2/3/4/5/6	Communications has failed to MSP1,2,3,4, 5, 6	Alarm Notify for Service
CAL	1/2/3	Calibration of MSP 1,2,3 required	Alarm Notify for Service
SP1T	FLT / OK	Supply 1 has failed (no supply)	Transfers to supply 2 if on 1
SP 1	LOW /OK	Supply 1 Steady State Low (1 sec)	Transfers to supply 2 if on 1
SP 1	HI / OK	Supply 1 Steady State High (1 sec)	Transfers to supply 2 if on 1
HZ 1	LOW / HI / OK	Frequency of supply 1 is high or low	Alarm No action
SYNC	LOS / OK	Output is not in synchronism with alt. supply	Alarm No action
SP2T	FLT / OK	Transient Event that Incoming Supply too high	Transfers to supply 1 if on 2
SP 2	LOW /OK	Transient Event that Incoming Supply too Low	Transfers to supply 1 if on 2
SP 2	HI / OK	Supply 2 has failed (no supply)	Transfers to supply 1 if on 2
HZ 2	LOW / HI /OK	Frequency of supply 2 is high or low	Alarm No action
SP 3T	FLT / OK	Output Supply 3 has failed (no supply)	Transfers to alternate supply
SP 3	LOW OK	Output Supply 3 Steady State Low (1 sec)	Transfers to alternate supply
SP 3	HI / OK	Output Supply 3 Steady State High (1 sec)	Transfers to alternate supply
O/LD	WAN / OK	Output is overloaded	Alarm reduce loading
LOAD	FLT / OK	Output has experienced a load fault	Inhibits transfer to alt. supply
CURR	HI/ OK	Output is overloaded	Reduce load on STS

SAMPLE ONLY

FAIL	S1 / S2 / S3	Supply source has failed	Reinstate Source S1/S2
OVRD	1 / 2 / 0	Manual override switch set to 1 or 2 or none	Locks to selected supply
PREF	1 / 2 / 0	Preferred Source SW 1 or 2 or None selected	Status - No action
THDI	HI / OK	Total harmonic Distortion of current is very high	User Alarm / Status- Check Load
THDV	HI / OK	Total harmonic Distortion of Voltage is too high	User Alarm / Status- Check Load
HSOT	HI/LO	Heat Sink is Over temperature	Calls Fault – Inhibits Output
FAN	FLT / OK	Fan Failure (if applicable)	Alarm Notify for Service
LPM	1 / 2/ 3 /OFF	Indicates that data preserved by battery	Status / debug indication only
RMTX	1 / 2	Remote Transfer Request	Status indication only
LOTX	1 / 2	Local Transfer Request	Status indication only
XFER	1/ 2	Transfer to 1 OR 2 occurred	Status Transfers to Supply #
VARF	FLT /OK	Varistors failed	Alarm Notify for Service
PWRS	1/2/3	Power supply monitoring	Restore S1,S2, S3 or PRS failed
SCRS	S1 / S2	Detected open circuit thyristor	Inhibits transfers
SCRO	S1 / S2	Detected short circuit thyristor	Inhibits transfers
ALMC		Front panel pushbutton has been pressed	Status indication only
BKFD	S1 / S2	>40 V Pk on incoming S1 or S2 when S1 or 2 failed	CAUTION Shock Hazard on S1&S2

SAMPLE ONLY

12. FAULT DIAGNOSIS & MAINTENANCE

The STS s has been manufactured to provide a long, reliable and useful life. However, all equipment needs some maintenance.

If the screen does not come up with the normal WELCOME page then it may be necessary to RESET the control panel. This is accomplished by pressing and holding all of the front panel pushbuttons simultaneously for more than 3 seconds.

Operate only if control is lost or the display is corrupt and normal display selection pushbuttons do not fix the problem. Report such occurrences.

After the welcome sign you may be prompted to enter the date and time. This will be required the first time only. We strongly encourage the setting of the date and time so that real time event correlation can be undertaken. The Real Time Clock is thereafter battery backed up.

Recommended Schedule

Once per month record the operating variables and compare with the units specifications to ensure that you are within its operating capability. Inspect the unit and note down any variations from last observation. Action may need to be taken and or reporting may need to be taken on these variances.

Once every 6 months, (sooner if the environment is bad), vacuum dust from grills at front of unit. Inspect cable / plug connections at rear for overheating.

Units with fans need their fans changed every 7 – 8 years, (70,000 Hrs life).

NOTE

Please note that the user should not undertake repair procedures or gains access to the internal of the equipment. If the unit is faulty then it should be removed from service as per the accompanying procedure and returned for repair.

SAMPLE ONLY

13. SET-UP / CALIBRATION & ADJUSTMENT

After entering the correct password access to the following adjustment screens is available.

The user should use caution in adjusting any of the operational variables as incorrect setting may cause incorrect operation and or loss of the critical load.

The following screens indicate the contents and functionality.

- Screen 5

Calibration	Read	Actual
S1 Volts	240	240
S2 Volts	240	240
S3 Volts	240	240
S3 Current	5	5
S3 kW	5	5
S3 kVA	5	5
S3 CF	L3	L3
Phase	5	5

240 Volts RMS
240 Volts RMS
240 Volts RMS
100 % RMS
*Calculated V *A as % of Rated*
Calculated kW as % of Rated
1.4 or peak : RMS calculated
in degrees supply1 to supply2

User measures Actual using a reference meter and types in the value under the column Actual. If using the LCD then use the ▶ key to move to the correct field and then the ▼ key to scroll to the correct value.

Once completed an exit is affected by ▶ key through the selection list past the last calibration option.

SAMPLE ONLY

14. PARTS LIST

Part	Description	Manufacturer	Part Number	Rating
THYM1,THYM2	Thyristors	Semikron	SK120 KQ - 16	120 Amps RMS , 2KA
SNB1, SNB2	DV/DT LIMITER	SP	SKC1033C	100 v/usec
CT1	CURRENT TRANSFORMER	TELEMA	AS100	100 Amps
Q1,Q2	ISOLATOR	MERLIN GERIN	i63	63 Amps
PLUG	POWER PLUG – MALE	ANDERSON	P1-75	75Amps
FUSE	**POWER SEMICONDUCTOR FUSE**	BUSSMAN	FE100	100 Amps
SOCKET	POWER SOCKET-FEMALE	ANDERSON	P1-75	75 Amps
MAINTENANCE BYPASS	CAM OPERATED – 2 POLE, 3-POSITION, OVERLAPPING	ASN SWITCHGEAR	WA53/50E-41	70 Amps
SP001a	POWER CONTROL BOARD	STATIC POWER	SP001-02	n/a
SP001ba	POWER CONTROL BOARD	STATIC POWER	SP001-02	n/a
SP002	STS CONTROL BOARD	STATIC POWER	SP002-01	n/a
SP003	DISPLAY BOARD	STATIC POWER	SP003-00	n/a
SP004	USER I/O BOARD	STATIC POWER	SP004-01	n/a
SP005	PARALLEL CONTROL BOARD	STATIC POWER	SP005-02	n/a

SAMPLE ONLY

15. CONTACTS

i – STS Manufacturing is a subsidiary of STATIC POWER PTY. LTD.
ABN 42 101 765 913

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